

## **IN THE CLAIMS**

What is claimed is:

1. A tubular string feature locator for detecting when a selected characteristic on a  
5 tubular string suspended in a well has a preselected vertical relationship to the rig  
elevator, the locator comprising:

sensor means to detect at least one characteristic of the tubular that has a known  
vertical relationship to a location on the tubular selected for gripping with elevator  
mounted tubular gripping means and to produce an output signal when the characteristic  
10 is sensed;

a sensor mounting arrangement that places the sensor means the same distance  
and direction from the elevator tubular gripping means as the known distance and  
direction between the characteristic to be sensed and the location on the tubular selected  
for gripping.  
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2. A tubular string feature locator for detecting the vertical position of a tubular  
string suspended in a well relative to the rig elevator, the locator comprising:

a drilling rig elevator to function as a carrier for tubular feature sensors and  
related mounting means;

20 a plurality of said tubular feature sensors mounted on said elevator and arranged  
to sense selected characteristics of tubular extending through the elevator and to produce  
an output signal indicative of the presence of selected tubular characteristics; and

said output signal comprising a change in the resistance to flow of fluid through  
a valve actuated in response to changes in the tubular feature characteristics sensed.  
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3. A tubular string feature locator for detecting the vertical position of a tubular  
string suspended in a well relative to the rig elevator, the locator comprising:

a drilling rig elevator to function as a carrier for tubular feature sensors and  
related mounting means;

30 a plurality of said tubular feature sensors mounted on said elevator and arranged  
to sense selected characteristics of tubular extending through the elevator and to produce  
an output signal component indicative of the presence of the selected tubular

characteristics; and

the total of said signal components to comprise a signal to indicate the presence of a said feature.

5     4.     The tubular string feature locator according to Claim 3 wherein said sensor comprises a plurality of sensors, each of which has a mechanical element extending from the sensor to the surface of tubular extending through the elevator.

10     5.     The tubular string feature locator according to Claim 3 wherein the function of said sensor is achieved by the arrangement of at least two vertically adjacent sensors on different vertical locations, by which process the sensors collectively accommodate lateral movement of said tubular, both sensing the movement, and the feature change being sensed when one sensor detects tubular string features the other sensor does not detect.

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6.     A tubular string feature locator for detecting the vertical position of a tubular string suspended in a well relative to the rig elevator, the locator comprising:

a drilling rig elevator to function as a carrier for tubular feature sensors and related mounting means;

20     a plurality of said tubular feature sensors mounted on said elevator and arranged to sense selected characteristics of tubular extending through the elevator and to produce an output signal indicative of the presence of selected tubular characteristics; and

25     wherein said sensors each carry a pulley that moves radially in sympathy with changes in sensed tubular diameter, a filament reeved about all said pulleys such that the movement of the pulleys, collectively, results in a consequent proportional change in the length of filament needed to complete the circuit about all pulleys, said change in needed filament length being satisfied by movement of an input member of a signal conditioner which produces the output signal.

30     7.     A tubular string feature locator for detecting the vertical position of a tubular string suspended in a well relative to the rig elevator, the locator comprising:

a drilling rig elevator to function as a carrier for tubular feature sensors and

related mounting means; and

at least one of said tubular feature sensors mounted on said elevator and arranged to sense selected characteristics of tubular extending through the elevator and to produce an output signal indicative of the presence of selected tubular characteristics,

5            wherein said sensor projects a stream of air toward the surface of said tubular, and detects a change in resistance to the air flow caused by changes in the characteristics of the tubular.

8.        The tubular string feature locator according to Claim 7 wherein said signal is  
10        conveyed as a pressure change.

9.        A tubular string feature locator for detecting the vertical position of a tubular string suspended in a well relative to the rig elevator, the locator comprising:

15            a drilling rig elevator to function as a carrier for tubular feature sensors and related mounting means;

at least one of said tubular feature sensors mounted on said elevator and arranged to sense selected characteristics of tubular extending through the elevator and to produce an output signal indicative of the presence of selected tubular characteristics, and

20            said sensors mounted on a transition plate which is laterally movable, within limits, relative to the elevator to which it is attached, by which the sensors can be mounted closer to a tubular capable of lateral movement relative to the elevator.

10.       A tubular string feature locator for detecting the vertical position of a tubular string suspended in a well relative to the rig elevator, the locator comprising:

25            a drilling rig elevator to function as a carrier for tubular feature sensors and related mounting means;

at least one of said tubular feature sensors mounted on said elevator and arranged to sense selected characteristics of tubular extending through the elevator and to produce an output signal indicative of the presence of selected tubular characteristics, and

30            wherein said sensor emits sound to travel through the airspace surrounding the tubular to impinge upon the surface of the tubular, and respond to airborne echo characteristic to determine the distance between reference features on the tubular, and the

sensor, said output signals from each sensor being processed to produce sensed tubular feature related information.

11. A tubular string feature locator for detecting the vertical position of a tubular string suspended in a well relative to the rig elevator, the locator comprising:
- 5 a drilling rig elevator to function as a carrier for tubular feature sensors and related mounting means;
- at least one said tubular feature sensors mounted on said elevator and arranged to sense selected characteristics of tubular extending through the elevator and to produce an output signal indicative of the presence of selected tubular characteristics; and
- 10 said sensor being a capacitive arrangement arranged to respond to the proximity of tubular and sensor to produce said signal.

12. A tubular string feature locator for detecting when a selected characteristic on a tubular string suspended in a well has a preselected vertical relationship to the rig elevator and wherein an outside diameter of a tubular is smaller than an outside diameter of a collar attached to said tubular, the locator comprising:
- 15 means to detect a position of said collar that has a known vertical relationship to a location on the tubular selected for gripping with an elevator mounted tubular gripping assembly and to produce an output signal when the characteristic is sensed.
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13. An apparatus for indicating a desired position of a suspended insertable oil field assembly capable of being lowered into a tubular comprising :
- a traveling block from which are suspended at least two bails having first and second lower ends respectively;
- 25 an elevator fixedly attached to said bails;
- an insertable oil field assembly, having a lower end, suspended from said traveling block, whereby said traveling block insertably lowers said an insertable oil field assembly into a tubular positioned below said traveling block, wherein said an insertable oil field assembly has a first reflecting surface disposed about said an insertable oil field assembly at a pre-determined distance from the lower end of said an insertable oil field assembly; and
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a sensor, capable of emitting a signal to be reflected by said first reflecting surface disposed about said an insertable oil field assembly, wherein the reflected signal indicates the position of said an insertable oil field assembly relative to said tubular.

5     14.     The position indicating apparatus of Claim 13 further comprising:

          a second reflecting surface wherein said second reflecting surface is positioned substantially 180 degrees from said sensor, and wherein said second reflecting surface being capable of reflecting said sensor signal when said first reflecting surface is mis-aligned.

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15     15.     The position indicating apparatus of Claim 14 wherein said sensor, said first reflecting surface, and said second reflecting surface are substantially aligned in the same horizontal plane.

15     16.     The position indicating apparatus of Claim 12 wherein said sensor is mounted on said bails.

17.     The position indicating apparatus of Claim 12 wherein said sensor is mounted on said elevator.

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18.     An apparatus for indicating the position of an oil field assembly suspended for insertion into a tubular comprising :

          a rig suspension system for lowering tubulars and oil field assemblies, each having an outside surface, into a wellbore;

25           a reflective surface disposed about the outside surface of said oil field tool;

          an elevator fixedly attached to said rig suspension system; and

          a sensor mounted to said elevator, said sensor being capable of emitting a signal capable of being reflected by said reflective surface, wherein said reflected signal indicates the position of said oil field assembly with respect to said tubular.

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19.     The apparatus of Claim 18 wherein said sensor and said reflecting surface are substantially aligned in the same horizontal plane.

20. The apparatus of Claim 18 further comprising :  
a second reflecting surface for reflecting said sensor emitted signal when the first reflecting surface is mis-aligned.

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21. An apparatus of claim 18 wherein said sensor further comprises:  
a housing for fixedly mounting said sensor to said rig suspension system;  
a signal emitter for emitting a signal capable of being reflected by said reflecting surface;

10 a signal receiver for receiving the signal reflected by said reflecting surface;  
a cover for the signal emitter and the signal receiver; and  
an air supply, wherein said air supply provides air flow across said cover to prevent substance accumulation which will interfere with said signal emitter and signal receiver device.

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22. A sensor indicating the position of an oil field assembly suspended for insertion into a tubular comprising :

a housing for fixedly mounting said sensor to said rig suspension system;  
a signal emitter for emitting a signal capable of being reflected by a reflecting  
20 surface, said reflecting surface being disposed about said oil field assembly;  
a signal receiver for receiving the signal reflected by said reflecting surface;  
a cover for the signal emitter and the signal receiver; and  
an air supply, wherein said air supply provides air flow across said cover to prevent substance accumulation which will interfere with said signal emitter and signal  
25 receiver,

wherein the reflected signal indicates the position of said oil field assembly with respect to said tubular.

23. The sensor of Claim 22 wherein said sensor is mounted to elevator bails  
30 depending from said rig suspension system.

24. The sensor of Claim 22 wherein said sensor is mounted on an elevator depending

from said rig suspension system.

25. A tubular string feature and position locator for detecting the vertical position of a tubular suspended in a well bore comprising:

5 a drilling elevator to function as a carrier for sensors and related mounting apparatus;

at least one sensor mounted on said elevator arranged to sense selected characteristics of tubular extending through the elevator and to produce an output signal indicative of the presence of selected tubular characteristics;

10 at least one sensor mounted on said elevator arranged to sense the position of an insertable oil field assembly suspended, for insertion into said tubular, from the rig and being lowered substantially in tandem with said elevator, said sensor being capable of producing an output signal indicative of the position of the suspended insertable oil field assembly relative to said tubular.

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26. A tubular string feature and position locator of Claim 25 wherein the sensors for detecting the tubular characteristics and the insertable oil field assembly position are mounted in a single housing and wherein the output signal is processed to indicate said tubular characteristics and said position indication.

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27. A method for indicating a desired position of a rig suspended insertable oil field assembly capable of being lowered into a tubular comprising :

providing a rig suspension and lowering system;

25 lowering an elevator which is lowered substantially in tandem with said rig suspended an insertable oil field assembly;

suspending said insertable oil field assembly, having a lower end, from said rig suspension and lowering system, whereby said rig suspension and lowering system insertably lowers said insertable oil field assembly into a tubular positioned below said rig suspension and lowering system, wherein said an insertable oil field assembly has a  
30 first reflecting surface disposed about said insertable oil field assembly at a pre-determined distance from the lower end of said an insertable oil field assembly;

emitting a signal to be reflected by said reflecting surface disposed about said

insertable oil field assembly, wherein the reflected signal indicates the position of said insertable oil field assembly relative to said tubular; and

indicating, by a signal, that said insertable oil field assembly has been insertably positioned within said tubular at a pre-determined distance.

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28. A tubular string feature and position locator for detecting the vertical position of a tubular suspended in a well bore comprising:

a traveling block from which are suspended at least two bails having a first and second lower ends respectively;

10 a drilling elevator to function as a carrier for sensors and related mounting apparatus, wherein said elevator is suspended from said at least two bails;

at least one sensor mounted on said elevator arranged to sense selected characteristics of tubular extending through the elevator and to produce an output signal indicative of the presence of selected tubular characteristics; and

15 at least one sensor mounted on said bails arranged to sense the position of an insertable oil field assembly suspended, for insertion into said tubular, from the rig and being lowered substantially in tandem with said elevator, said sensor being capable of producing an output signal indicative of the position of the suspended insertable oil field assembly relative to said tubular.